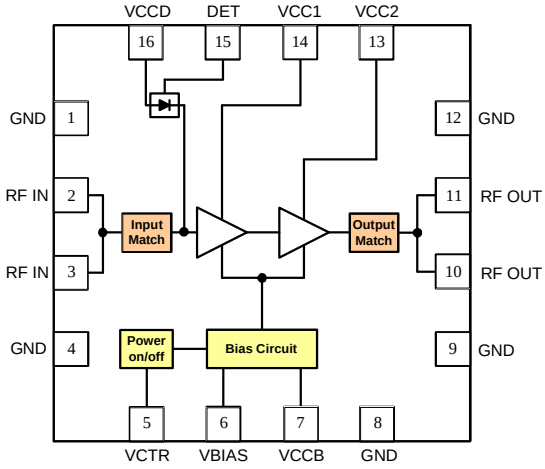
*RoHS & Pb-Free Product*

## Features

- 4.9~5.9GHz Frequency Range
- 3.3V~5.5V Operation
- 3.0% EVM@24dBm for 802.11a 54Mbps, 5.5V
- 3.0% EVM@22.5dBm for 802.11a 54Mbps, 5V
- 2.5% EVM@18dBm for 802.11a 54Mbps, 3.3V
- 240mA Quiescent Current
- 22dB Gain (Typ)
- >20dB Input Return Loss@5.8GHz
- On-Chip Power Detector




**Functional Block Diagram**

## Applications

- IEEE 802.11a/n WLAN
- C band application
- 5.8GHz RFID
- Spread-Spectrum and MMDS Systems

## Product Description

The AC552228 is a 2-stage 4.9-5.9GHz high efficiency, high linearity power amplifier based on InGaP/GaAs HBT technology. The amplifier provides a typical gain of 22 dB and P1dB power of 30.5 dBm, typical bias condition is 5.5V at 240 mA. The input and output are internally matched to 50Ω and require a minimum of external matching components to cover the entire 4.9GHz to 5.9GHz. The AC552228 is assembled in a 16-pin, 4mm×4mm, QFN package.

## Ordering Information

- AC552228 5.8GHz Linear Power Amplifier
- AC552228EVB-1 5.2GHz to 5.8GHz Evaluation PCB
- AC552228EVB-2 5.6GHz to 5.9GHz Evaluation PCB

## Pin Description

| Pin No. | Symbol | Description |
|---|---|---|
| 1, 4, 8, 9, 12 | NC/GND | No connection or Ground connection |
| 2, 3 | RF IN | RF input |
| 5 | VCTR | Power on/off control voltage |
| 6 | VBIAS | Bias voltage |
| 7 | VCCB | Supply voltage for bias |
| 10, 11 | RF OUT | RF output |
| 13 / 14 | VCC2 / VCC1 | Supply voltage for the 2nd / 1st stage |
| 15 | DET | Provides an output voltage proportional to the RF level |
| 16 | VCCD | Supply voltage for power detector |
| Pkg Base | GND | Ground connection |

## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Input RF Power | +15 | dBm |
| Supply Voltage | -0.5 to +7.0 | V |
| Bias Voltage | -0.5 to +4.0 | V |
| DC Supply Current | 1000 | mA |
| Operating Ambient Temperature | -40 to +85 | °C |
| Storage Temperature | -40 to +150 | °C |

**Caution! ESD sensitive device.**

ESD Rating: Class1C
Value: Passes≥1000V min.
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV
Value: Passes ≥1000V min.
Test: Charged Device Model (CDM)
Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 3 at +260 °C convection reflow
Standard: JEDEC Standard J-STD-020

# Electrical Specifications

**Table 1 Test Frequency: 5.6 to 5.9GHz (VCC1, VCC2 = 5.5 V, Temp = +25°C)**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC=5.5V, ICC=240mA, Temp=+25°C, Freq=5.6GHz to 5.9GHz |
| Frequency Range | 5.6 | 5.8 | 5.9 | GHz | |
| Output Power@1dB Compression | | 30.5 | | dBm | VCC=5.5V@5.8 GHz |
| Gain | | 21.5 | | dB | VCC=5.5V@5.8 GHz |
| EVM | | 3.0 | 3.2 | % | Pout=+24dBm, VCC =5.5V@5.8 GHz 802.11a, 54 Mbps, 64QAM |
| **Power Supply** | | | | | |
| Operating Voltage | | 5.5 | | V | |
| Bias Voltage | | 2.83 | | V | |
| Quiescent Current (Total) | | 240 | | mA | |

**(VCC1, VCC2 = 5.0 V, Temp = +25°C)**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC =5.0V, ICC=240mA, Temp=+25°C, Freq=5.6GHz to 5.9GHz |
| Frequency Range | 5.6 | 5.8 | 5.9 | GHz | |
| Output Power@1dB Compression | | 29.5 | | dBm | VCC=5.0V@5.8 GHz |
| Gain | | 22 | | dB | VCC=5.0V@5.8 GHz |
| EVM | | 3.0 | | % | Pout=+22.5dBm, VCC =5.0V@5.8 GHz 802.11a, 54 Mbps, 64QAM |
| **Power Supply** | | | | | |
| Operating Voltage | | 5.0 | | V | |
| Bias Voltage | | 2.87 | | V | |
| Quiescent Current (Total) | | 240 | | mA | |

**Table 2 Test Frequency: 5.2 to 5.8GHz**

**(VCC1, VCC2 = 5.0 V, Temp = +25°C)**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC =5.0V, ICC=300mA, Temp=+25°C, Freq=5.2GHz to 5.8GHz |
| Frequency Range | 5.2 | 5.5 | 5.8 | GHz | |
| Output Power | | 28 | 28.5 | dBm | VCC=5.0V@5.5 GHz |
| Gain | | 22 | | dB | VCC=5.0V@5.5 GHz |
| EVM | | 3.2 | | % | Pout=+27dBm, VCC =5.0V@5.5 GHz 802.16d, 64QAM |
| | | 3.2 | | % | Pout=+22dBm, VCC =5.0V@5.5 GHz 802.11a, 54 Mbps, 64QAM |
| | | 3.3 | | % | Pout=+22dBm, VCC =5.0V@5.5 GHz 802.11n, 81 Mbps, QPSK |
| **Power Supply** | | | | | |
| Operating Voltage | | 5.0 | | V | |
| Bias Voltage | | 3.0 | | V | |
| Quiescent Current (Total) | | 300 | | mA | |

**(VCC1, VCC2 = 3.3 V, Temp = +25°C)**

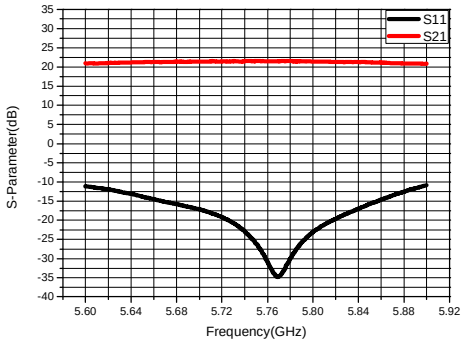
| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC =3.3V, ICC=300mA, Temp=+25°C, Freq=5.2GHz to 5.8GHz |
| Frequency Range | 5.2 | 5.5 | 5.8 | GHz | |
| Output Power | | 25 | 25.5 | dBm | VCC=3.3V, ICC=300mA@5.5 GHz |
| Gain | | 21 | | dB | VCC=3.3V@5.5 GHz |
| EVM | | 2.6 | | % | Pout=+23dBm, VCC =3.3V@5.5 GHz 802.16d, 64QAM |
| | | 2.3 | | % | Pout=+18dBm, VCC =3.3V@5.5 GHz 802.11a, 54 Mbps, 64QAM |
| | | 2.4 | | % | Pout=+17dBm, VCC =3.3V@5.5 GHz 802.11n, 81 Mbps, QPSK |
| **Power Supply** | | | | | |
| Operating Voltage | | 3.3 | | V | |
| Bias Voltage | | 3.2 | | V | |
| Quiescent Current (Total) | | 300 | | mA | |

## Typical Performance Data

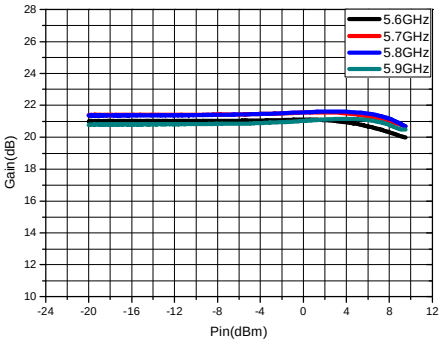
**Test Frequency: 5.6 to 5.9GHz**

**(Test Condition: VCC=5.5V, ICC=240mA, T=25°C)**

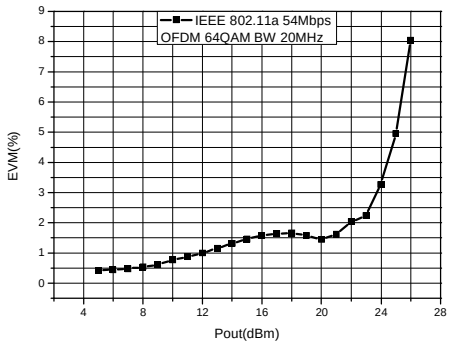
**Small Signal Parameters**




**Power Gain vs. Input Power**

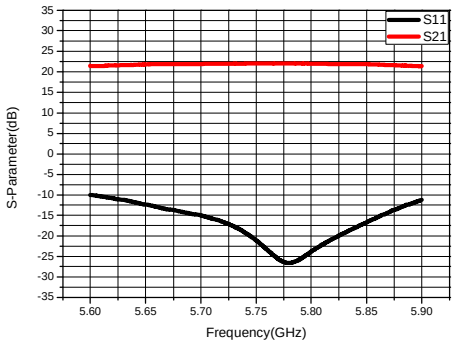



**802.11a EVM vs. Output Power @5.8GHz**

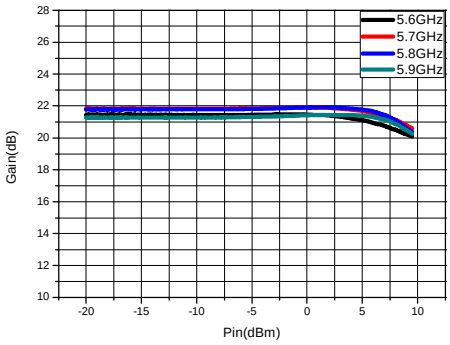


**(Test Condition: VCC=5.0V, ICC=240mA, T=25°C)**

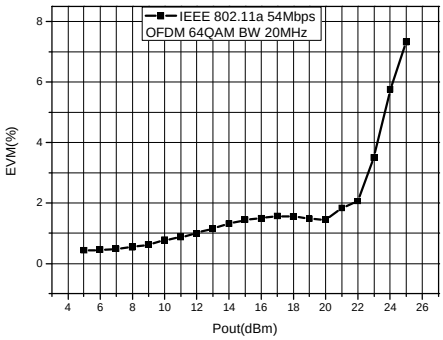
**Small Signal Parameters**




**Power Gain vs. Input Power**




**802.11a EVM vs. Output Power @5.8GHz**

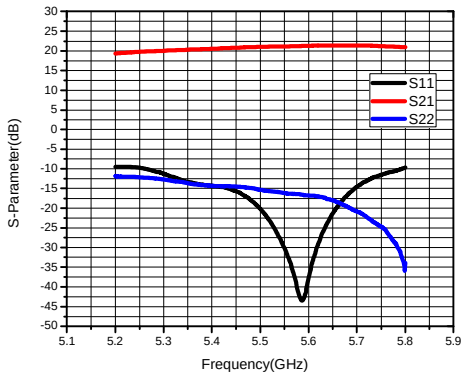


## Typical Performance Data

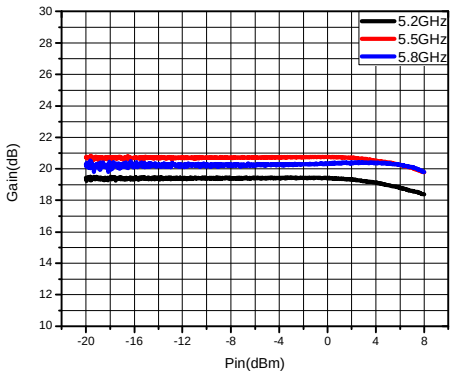
**Test Frequency: 5.2 GHz to 5.8GHz**

**(Test Condition: VCC=5.0V, ICC=300mA, T=25°C)**

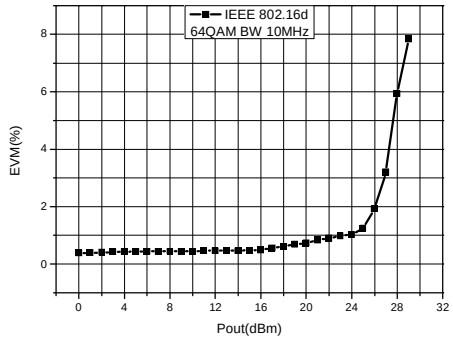
**Small Signal Parameters**



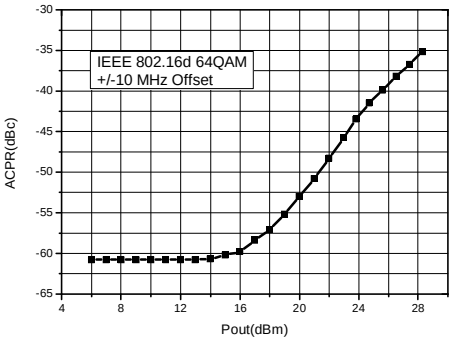

**Power Gain vs. Input Power**



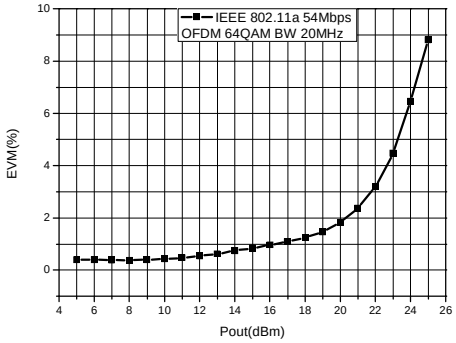

**802.16d EVM vs. Output Power @5.5GHz**



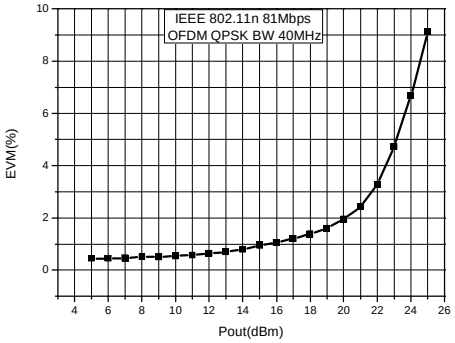

**802.16d ACPR vs. Output Power @5.5GHz**




**802.11a EVM vs. Output Power @5.5GHz**

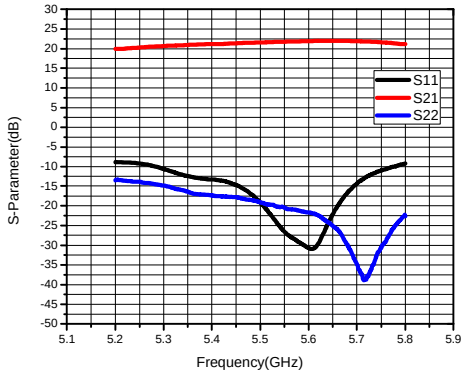



**802.11n EVM vs. Output Power @5.5GHz**

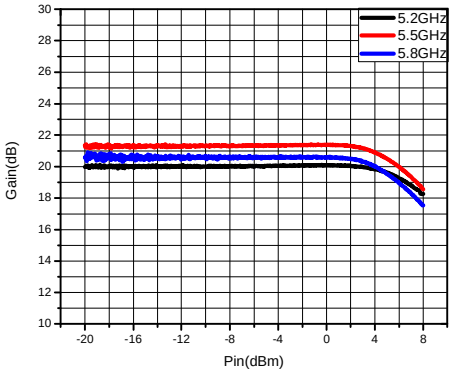


**(Test Condition: VCC=3.3V, ICC=300mA, T=25°C)**

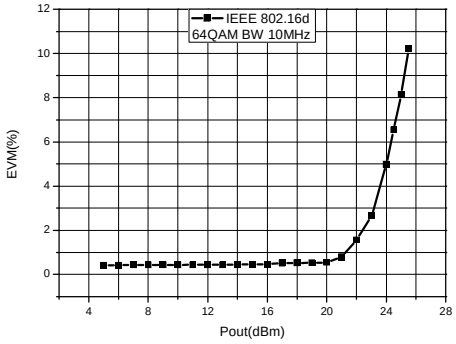
**Small Signal Parameters**



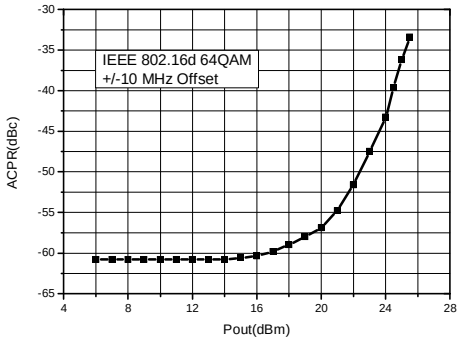

**Power Gain vs. Input Power**



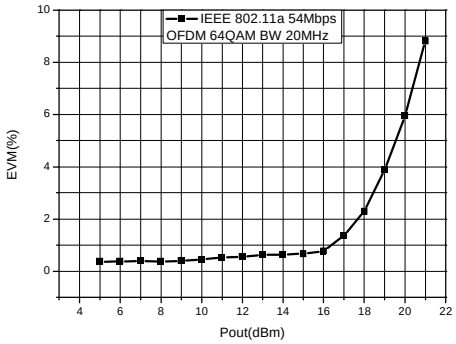

**802.16d EVM vs. Output Power @5.5GHz**



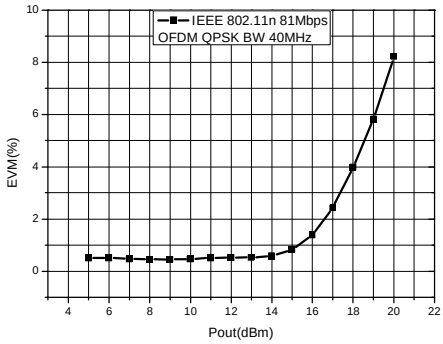

**802.16d ACPR vs. Output Power @5.5GHz**




**802.11a EVM vs. Output Power @5.5GHz**

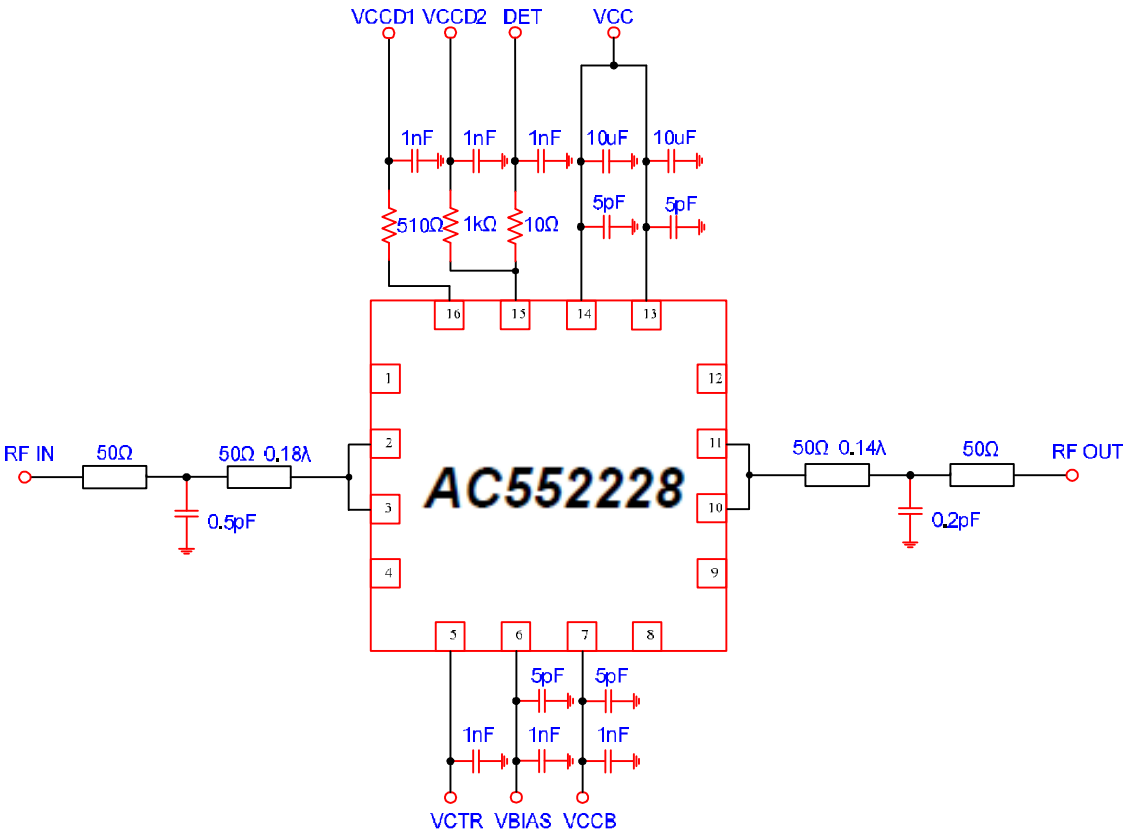



**802.11n EVM vs. Output Power @5.5GHz**



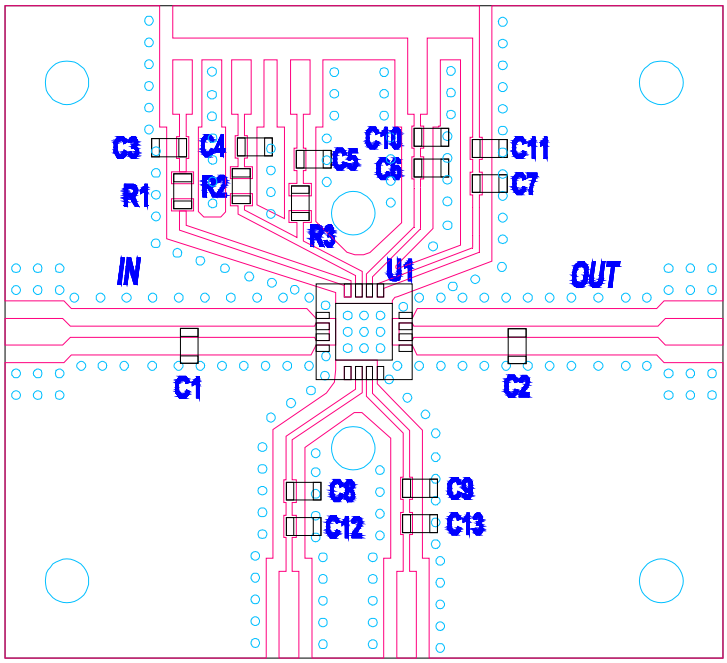
## Evaluation Board Schematic

**Test Frequency: 5.6 to 5.9GHz**
**(Supply Voltage Value refer to Table 1)**



## Evaluation Board Layout

**Test Frequency: 5.6 to 5.9GHz**
**Board Size: 33mm×30mm**
**Board Thickness: 0.4 mm, Board Material: FR-4 ($\varepsilon_r$=4.5)**

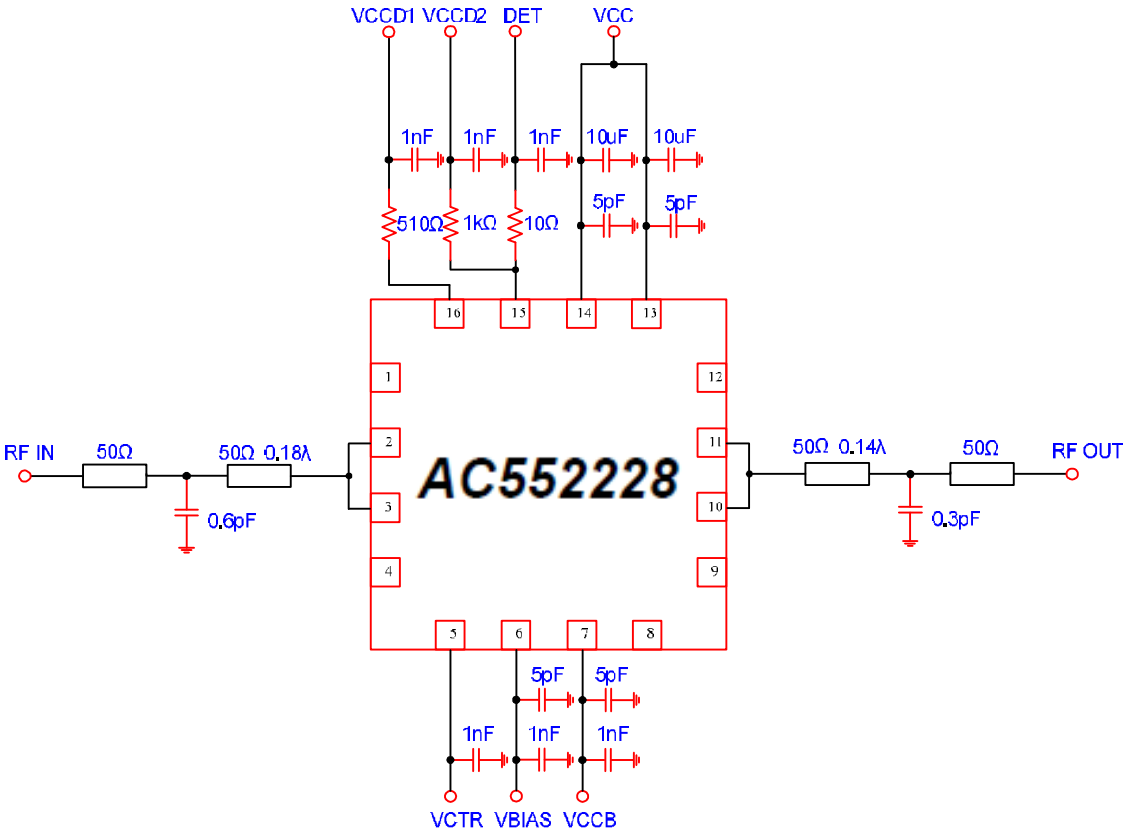



■ **Table 4: Circuit Component Designations and Values**

| Component | Description | Manufacturer |
|---|---|---|
| C1 | 0.5pF Chip Capacitor | ATC |
| C2 | 0.2pF Chip Capacitor | ATC |
| C3,C4,C5,C12,C13 | 1nF Chip Capacitor | TDK |
| C6,C7,C8,C9 | 5pF Chip Capacitor | TDK |
| C10,C11 | 10uF Chip Capacitor | TDK |
| R1 | 510Ω Chip Resistor | YAGEO |
| R2 | 1kΩ Chip Resistor | YAGEO |
| R3 | 10Ω Chip Resistor | YAGEO |
| U1 | AC552228 | INNOGRATION |

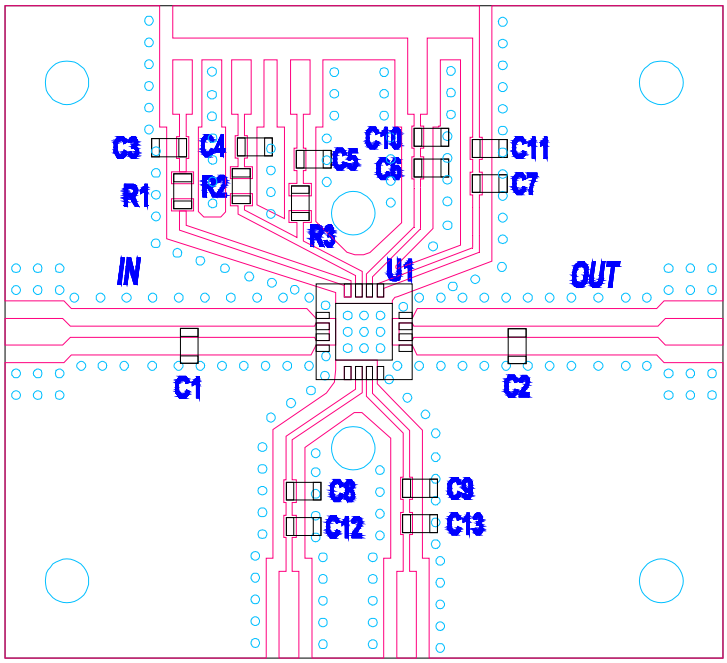
## Evaluation Board Schematic

**Test Frequency: 5.2 to 5.8GHz**
**(Supply Voltage Value refer to Table 2)**



## Evaluation Board Layout

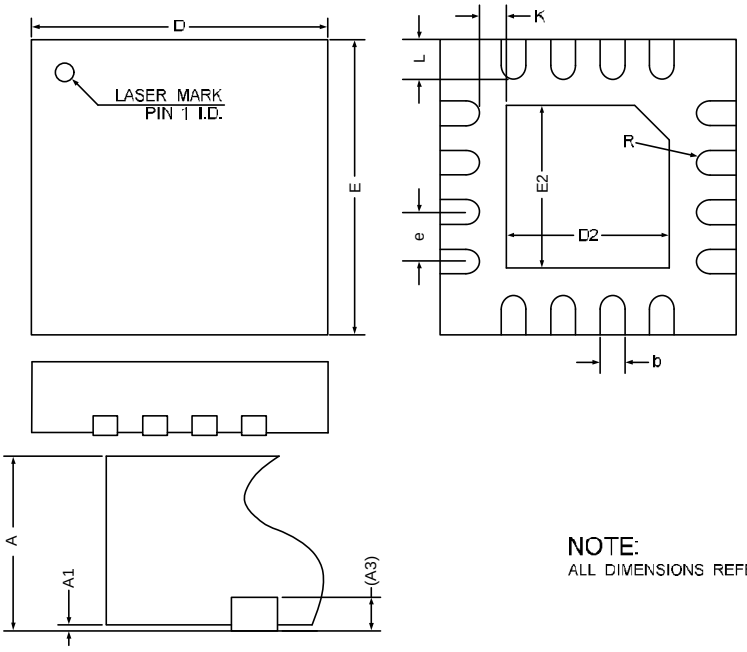
**Test Frequency: 5.2 to 5.8GHz**
**Board Size: 33mm×30mm**
**Board Thickness: 0.4mm, Board Material: FR-4 ($\varepsilon_r$=4.5)**




■ **Table 5: Circuit Component Designations and Values**

| Component | Description | Manufacturer |
|---|---|---|
| C1 | 0.6pF Chip Capacitor | ATC |
| C2 | 0.3pF Chip Capacitor | ATC |
| C3,C4,C5,C12,C13 | 1nF Chip Capacitor | TDK |
| C6,C7,C8,C9 | 5pF Chip Capacitor | TDK |
| C10,C11 | 10uF Chip Capacitor | TDK |
| R1 | 510Ω Chip Resistor | YAGEO |
| R2 | 1kΩ Chip Resistor | YAGEO |
| R3 | 10Ω Chip Resistor | YAGEO |
| U1 | AC552228 | Innogration |

# Packaging Diagram



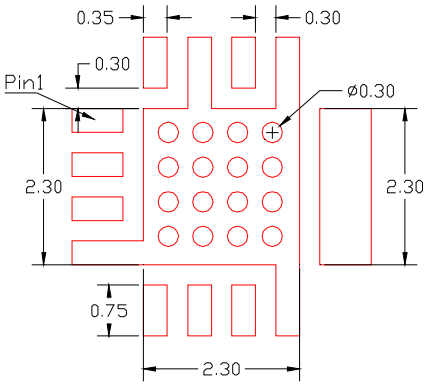

COMMON DIMENSIONS
(UNITS OF MEASURE = MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0 | 0.02 | 0.05 |
| A3 | | 0.203 REF | |
| b | 0.25 | 0.30 | 0.35 |
| D | 3.95 | 4.00 | 4.05 |
| E | 3.95 | 4.00 | 4.05 |
| D2 | 2.00 | 2.15 | 2.25 |
| E2 | 2.00 | 2.15 | 2.25 |
| e | 0.60 | 0.65 | 0.70 |
| K | 0.375 | | |
| L | 0.35 | 0.40 | 0.45 |
| R | 0.09 | | |

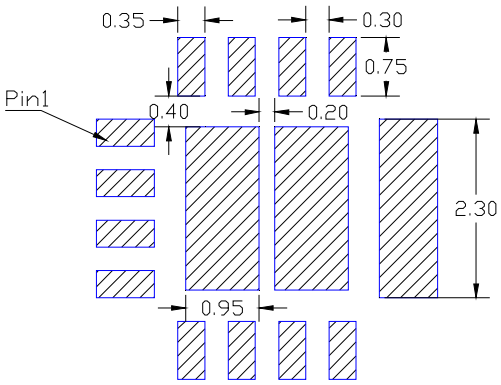
NOTE:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO-220 WEED-4.

# PCB Land Pattern and Stencil Outline

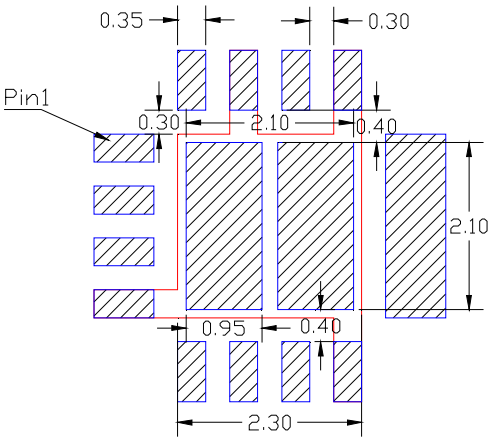
(Units: millimeters)




**PCB Land Pattern (Top View)**

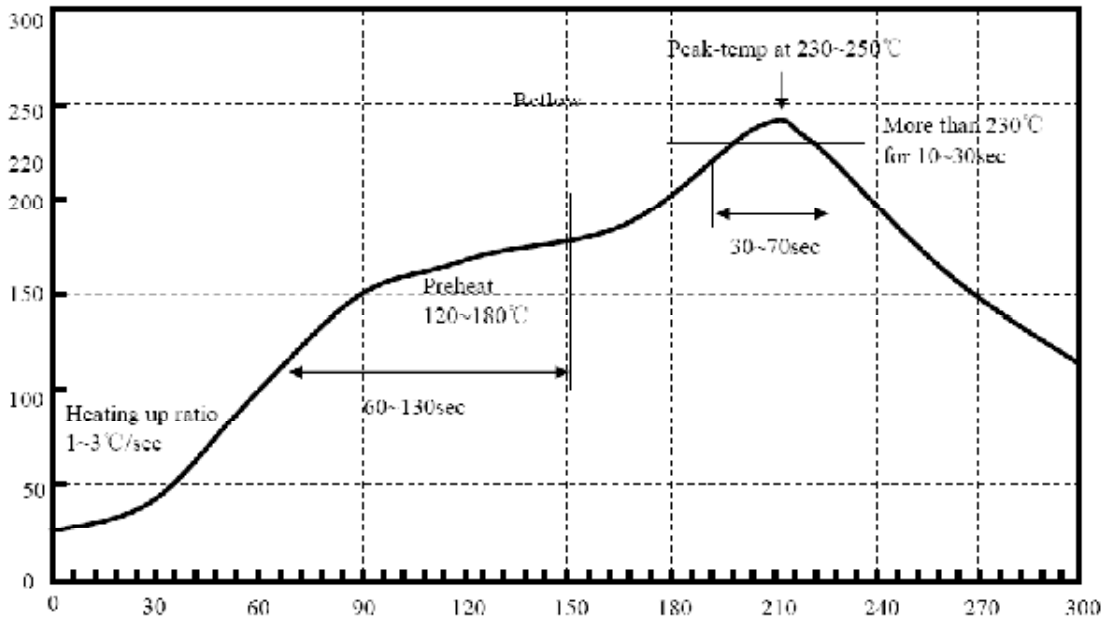



**Stencil Outline**




**Combined PCB Land Pattern and Stencil Outline**

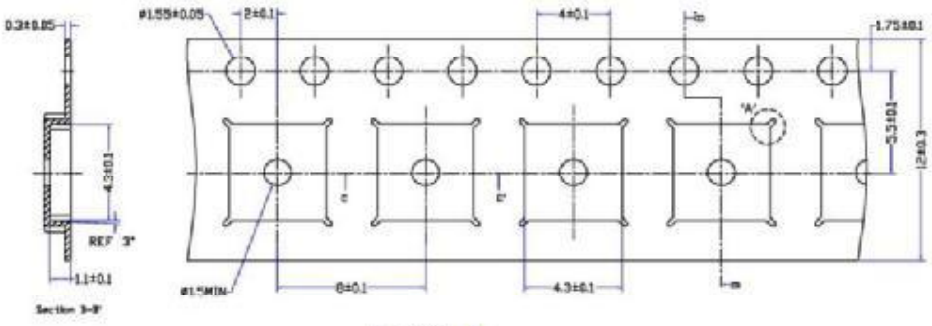
## Recommended Solder Temperature




**Recommended Temperature**

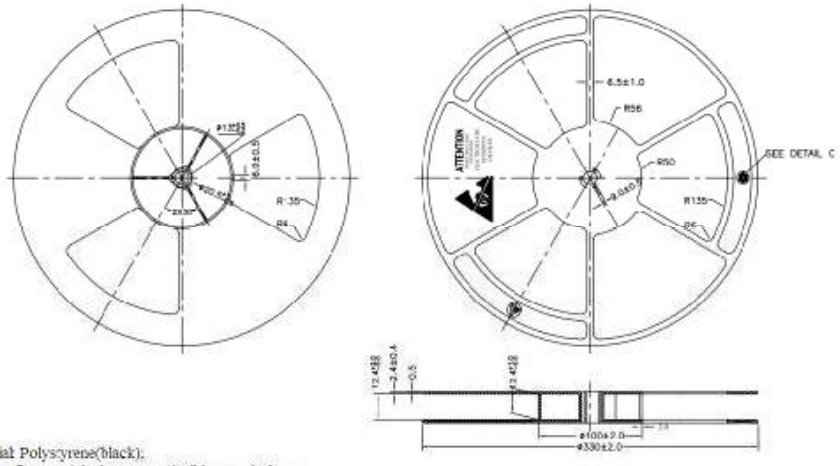
**Sn95.5Ag4.0Cu0.5**

## Tape dimensions and Orientation




NOTES:
1.10 pocket hole pitch cumulative tolerance ±0.2
2.Carrier camber is within 1mm in 100mm
3.MATERIAL:CONDUCTIVE POYSTYRENE
4.ALL DIMS IN MM
5.There must not be foreign body adhesion and the state of the surface must be excellent
6.17" PAPER-Reel, 51875pockets
7.Surface resistance 1X10E11(max) OHMS/SQ

## Reel dimensions and Orientation




**Notes:**
1. Material Polyscyrene(black);
2. Surface flatness: Maximum permissible error is 3mm;
3. Dimensions in millimeters;
4. Surface resistance: 105TO 1010/OHMS/SQ;
5. General tolerances: ±0.25